

CHAPTER 4

HARDWARE

The installation of electronic equipments necessitates the use of a great many different kinds and types of hardware items to include screws, nuts, bolts, fasteners, pins, clamps, etc. There is a wide variety of hardware items to meet every requirement of size, shape, strength, and material and this paragraph presents a representative sampling of those items frequently encountered in installation work. Commercial catalogs are available from most sources listed and activities should obtain them to assist in the selection of the correct hardware items to meet particular needs. It is recommended that within budgetary constraints, the guidelines in Handbook H-28 be followed in the selection of screw threads on installation hardware. (Note that MIL-STD-454 requires that threaded fasteners and related parts with tapped holes conform with either H-28 or MIL-S-7742 requirements.)

4.1 SCREWS AND BOLTS

Representative types of common screws and bolts are shown in figures 4-1 and 4-2. Information on types and manufacturers of set screws is presented in figure 4-3. Table 4-1 gives the head dimensions for a group of common machine screws, Table 4-2 lists the standard threads per inch for national fine and national coarse threads and Table 4-3 shows the available lengths in brass machine screw and bolt lengths.

4.2 THREADED STUDS

Types of threaded studs used to anchor or mount equipment are illustrated in figure 4-4. The installation of studs requires special knowledge and tools and would not ordinarily be performed in the field. The installer should have a knowledge of the various types of studs available and installation techniques in the event it becomes necessary to replace one.

4.3 NUTS, CLINCH NUTS, AND INSERTS

Extreme care must be taken in selecting the correct type and size nut from the great variety available to fasten equipment. Premature equipment failure and hazardous operations may result from the use of improper fastening methods and hardware. Figures 4-5 and 4-6 illustrate a variety of nuts and clinch nuts. Inserts are used to change the threaded diameter of a hole or to provide strong screw threads in soft material or sheet metal. They can be installed with standard shop tools in holes punched or drilled to normal tolerances. Figure 4-7 depicts several different types of inserts.

4.4 PINS

Figure 4-8 illustrates a variety of pins which are commonly used for installation work, together with information on hole and pin sizes and shear strength. When replacing pins the installer must be careful not to exceed the prescribed shear strength as the pin may also function as a safety device.

4.5 RIVETS

A representative group of various types of rivets used in the installation of electronic equipment is illustrated in figure 4-9.

4.6 FASTENERS

Fasteners come in a great variety of types, sizes, and materials. Fasteners provide a handy means of attaching panels and removable access doors and prevent their loosening under stress or vibration. Since each type has special features, care must be taken in the selection of a particular one so that maximum utilization is obtained. Figure 4-10 illustrates some of the many types in common use.

4.7 WASHERS AND RETAINING RINGS

Washers serve to provide a proper seating of the screw head and to keep the screw head from scarring the panel surfaces. Figure 4-11 illustrates four common type washers and the dimensions for various sizes. Retaining rings are used where a loose fitting pin must be kept from falling out of the hole or where it is necessary to keep a device on its mounting shaft. See figure 4-12.

4.8 THICKNESS GAUGES

Several systems are used to denote the standard thicknesses for wire and sheet metal. Table 4-4 provides a cross reference between these systems.

4.9 DRILL AND TAP SIZES

Tables 4-5, 4-6, and 4-7 list the drill and tap sizes to be used when holes must be drilled and tapped for standard machine screws, pipe, and bolts, respectively. The dimensions for hexagonal nuts are provided in Table 4-8.

4.10 DECIMAL EQUIVALENTS

Table 4-9 presents a cross reference between fractional inches, millimeters, wire gages and letter size drills, and decimal inches. This cross reference is especially useful when comparing sizes of drill bits. Some assortments of drill bits use the traditional inch system of numbering (1/64-inch steps between drills) while other assortments use the wire gage system (80, 79, 78, etc.).

Table 4-1. Machine Screw Head-Dimensions

| HEAD DIMENSIONS OF MACHINE SCREWS (INCHES) | | | | | | | | | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|------------|-------------|------|------|------|------|------|------|------|
| | #0 (.060) | #2 (.086) | #4 (.112) | #6 (.138) | #8 (.164) | #10 (.190) | 1/4" (.250) | | | | | | | |
| | Dia. | Ht. | Dia. | Ht. | Dia. | Ht. | Dia. | Ht. | Dia. | Ht. | Dia. | Ht. | Dia. | |
| Round | .113 | .053 | .162 | .069 | .211 | .086 | .260 | .103 | .309 | .120 | .359 | .137 | .472 | .175 |
| Flat (82°) | .119 | .035 | .172 | .051 | .225 | .067 | .279 | .083 | .332 | .100 | .385 | .116 | .507 | .153 |
| Flat (100°) | ---- | ---- | ---- | ---- | .225 | .048 | .279 | .060 | .332 | .072 | .385 | .083 | .507 | .110 |
| Oval | .119 | .056 | .172 | .080 | .225 | .104 | .279 | .128 | .332 | .152 | .385 | .176 | .507 | .232 |
| Fillister | .096 | .059 | .140 | .083 | .183 | .107 | .226 | .132 | .270 | .156 | .313 | .180 | .414 | .237 |
| Truss | ---- | ---- | .194 | .053 | .257 | .069 | .321 | .086 | .384 | .102 | .448 | .118 | .573 | .150 |
| Binding | ---- | ---- | .181 | .046 | .235 | .063 | .290 | .080 | .344 | .097 | .399 | .118 | .513 | .153 |
| Pan | ---- | ---- | .167 | .053 | .219 | .068 | .270 | .082 | .322 | .096 | .373 | .110 | .492 | .144 |
| Cross Recessed | ---- | ---- | .167 | .062 | .219 | .080 | .270 | .097 | .322 | .115 | .373 | .133 | .492 | .175 |
| Hex | ---- | ---- | .145 | .050 | .217 | .060 | .287 | .080 | .287 | .110 | .361 | .120 | .433 | .190 |

*In the case of the Hex Head machine screw the head diameter is actually the across-corners dimension.

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Table 4-2 Screw Threads per Inch National Fine and Coarse

| NO. OR FRACTIONAL SIZE | THREADS PER INCH | | NO. OR FRACTIONAL SIZE | THREADS PER INCH | |
|------------------------------|------------------|--------|------------------------------|------------------|--------|
| | FINE | COARSE | | FINE | COARSE |
| 0(0.080) | 80 | -- | 9/16 | 18 | 12 |
| 1(0.073) | 72 | 64 | 5/8 | 18 | 11 |
| 2(0.086) | 64 | 56 | 3/4 | 16 | 10 |
| 3(0.099) | 56 | 48 | 7/8 | 14 | 9 |
| 4(0.112) | 48 | 40 | 1 | 14 | 8 |
| 5(0.125) | 44 | 40 | 1-1/8 | 12 | 7 |
| 6(0.138) | 40 | 32 | 1-1/4 | 12 | 7 |
| 8(0.164) | 36 | 32 | 1-1/2 | 12 | 6 |
| 10(0.190) | 32 | 24 | 1-3/4 | 12 | 5 |
| 12(0.216) | 28 | 24 | 2 | 12 | 4-1/2 |
| 1/4 | 28 | 20 | 2-1/4 | 12 | 4-1/2 |
| 5/16 | 24 | 18 | 2-1/2 | 12 | 4 |
| 3/8 | 24 | 16 | 2-3/4 | 12 | 4 |
| 7/16 | 20 | 14 | 3 | 10 | 4 |
| 1/2 | 20 | 13 | | | |

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Table 4-3. Brass Machine Screws and Bolt Lengths

MACHINE SCREW SIZES

BOLT SIZES

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Table 4-4. Standard Wire and Sheet Metal Gages

| GAGE NO. | AMERICAN OR B & S (NOTE 1) | U.S. STANDARD (NOTE 2) | BIRMINGHAM OR STUBS (NOTE 3) |
|----------|----------------------------|------------------------|------------------------------|
| 1 | .2893 | .28125 | .300 |
| 2 | .2576 | .265625 | .284 |
| 3 | .2294 | .25 | .259 |
| 4 | .2043 | .234375 | .238 |
| 5 | .1819 | .21875 | .220 |
| 6 | .1620 | .203125 | .203 |
| 7 | .1443 | .1875 | .180 |
| 8 | .1285 | .171875 | .165 |
| 9 | .1144 | .15625 | .148 |
| 10 | .1019 | .140625 | .134 |
| 11 | .09074 | .125 | .120 |
| 12 | .08081 | .109375 | .109 |
| 13 | .07196 | .09375 | .095 |
| 14 | .06408 | .078125 | .083 |
| 15 | .05707 | .0703125 | .072 |
| 16 | .05082 | .0625 | .065 |
| 17 | .04526 | .05625 | .058 |
| 18 | .04030 | .05 | .049 |
| 19 | .03589 | .04375 | .042 |
| 20 | .03196 | .0375 | .035 |
| 21 | .02846 | .034375 | .032 |
| 22 | .02535 | .03125 | .028 |
| 23 | .02257 | .028125 | .025 |
| 24 | .02010 | .025 | .022 |
| 25 | .01790 | .021875 | .020 |
| 26 | .01594 | .01875 | .018 |
| 27 | .01420 | .0171875 | .016 |
| 28 | .01264 | .015625 | .014 |
| 29 | .01126 | .0140625 | .013 |
| 30 | .01003 | .0125 | .012 |
| 31 | .008928 | .0109375 | .010 |
| 32 | .007950 | .01015626 | .009 |
| 33 | .007080 | .009375 | .008 |
| 34 | .006350 | .00859375 | .007 |
| 35 | .005615 | .0078125 | .005 |
| 36 | .005000 | .00703125 | .004 |
| 37 | .004453 | .006640626 | ---- |
| 38 | .003965 | .00625 | ---- |
| 39 | .003531 | ----- | ---- |
| 40 | .003145 | ----- | ---- |

NOTE 1: Used for aluminum, copper, brass, and nonferrous alloy sheets, wire, and rods.

NOTE 2: Used for iron, steel, nickel, and ferrous alloy sheets, wire, and rods.

NOTE 3: Used for seamless tubes; also by some manufacturers for copper and brass.

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Table 4-5. Tap Drill Sizes - Machine Screws

| SIZE | THREADS/IN | SERIES | TAP DRILL | CLEARANCE DRILL |
|------|------------|--------|-----------|-----------------|
| 0 | 80 | NF | No. 56 | No. 52 |
| 1 | 64 | NC | No. 53 | No. 48 |
| | 72 | NF | No. 53 | No. 48 |
| 2 | 56 | NC | No. 50 | No. 43 |
| | 64 | NF | No. 50 | No. 43 |
| 3 | 48 | NC | No. 47 | No. 38 |
| | 56 | NF | No. 45 | No. 38 |
| 4 | 40 | NC | No. 43 | No. 32 |
| | 48 | NF | No. 42 | No. 32 |
| 5 | 40 | NC | No. 38 | No. 30 |
| | 44 | NF | No. 37 | No. 30 |
| 6 | 32 | NC | No. 36 | No. 27 |
| | 40 | NF | No. 33 | No. 27 |
| 8 | 32 | NC | No. 29 | No. 18 |
| | 36 | NF | No. 29 | No. 18 |
| 10 | 24 | NC | No. 25 | No. 9 |
| | 32 | NF | No. 21 | No. 9 |

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Table 4-6. Tap Drill Sizes - Pipe

| SIZE (NORMAL) | OD (ACTUAL) | THREADS PER INCH | TAP DRILL | CLEARANCE DRILL |
|------------------|----------------|---------------------|--------------|--------------------|
| 1/8 | .405 | 27 | 11/32 | 7/16 |
| 1/4 | .540 | 18 | 7/16 | 9/16 |
| 3/8 | .675 | 18 | 37/64 | 3/4 |
| 1/2 | .84 | 14 | 23/32 | 7/8 |
| 5/8 | 1.05 | 14 | 59/64 | 13/16 |
| 1 | 1.315 | 11-1/2 | 15/32 | 17/16 |
| 1-1/4 | 1.66 | 11-1/2 | 1-1/2 | 1-3/4 |
| 1-1/2 | 1.9 | 11-1/2 | 1-87/64 | 2 |
| 2 | 2.375 | 11-1/2 | 2-7/32 | 2-1/2 |
| 2-1/2 | 2.875 | 8 | 2-5/8 | 3 |
| 3 | 3.5 | 8 | 3-1/4 | 3-3/4 |
| 3-1/2 | 4.0 | 8 | 3-3/4 | 4-1/4 |
| 4 | 4.5 | 8 | 4-1/4 | 4-3/4 |

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Table 4-7. Tap Drill Sizes - Bolts

| SIZE | THREAD/IN | SERIES | TAP DRILL | CLEARANCE DRILL |
|------|-----------|--------|-----------|-----------------|
| 1/4 | 20 | NC | No. 7 | 17/64 |
| | 28 | NF | No. 3 | 17/64 |
| 5/16 | 18 | NC | No. F | 21/64 |
| | 24 | NF | No. I | 21/64 |
| 3/8 | 16 | NC | 5/16 | 25/64 |
| | 24 | NF | No. Q | 25/64 |
| 7/16 | 14 | NC | No. V | 29/64 |
| | 20 | NF | 25/64 | 29/64 |
| 1/2 | 13 | NC | 27/64 | 17/32 |
| | 20 | NF | 29/64 | 17/32 |
| 9/16 | 12 | NC | 31/64 | 19/32 |
| | 18 | NF | 33/64 | 19/32 |
| 5/8 | 11 | NC | 17/32 | 21/32 |
| | 18 | NF | 37/64 | 21/32 |
| 3/4 | 10 | NC | 21/32 | 25/32 |
| | 16 | NF | 11/16 | 25/32 |
| 7/8 | 9 | NC | 49/64 | 29/32 |
| | 14 | NF | 13/16 | 29/32 |

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Table 4-8. Hexagonal Nuts - Dimensions

| THREAD SIZE | WIDTH ACROSS FLATS | HEIGHT STANDARD | THREAD SIZE | WIDTH ACROSS FLATS | HEIGHT STANDARD |
|-------------|--------------------|-----------------|-------------|--------------------|-----------------|
| 0 | 5/32 | 3/64 | 5/16 | 1/2 | 17/64 |
| 1 | 5/32 | 3/64 | 3/8 | 9/16 | 21/64 |
| 2 | 3/16 | 1/16 | 7/16 | 11/16 | 3/8 |
| 3 | 3/16 | 1/16 | 1/2 | 3/4 | 7/16 |
| 4 | 1/4 | 3/32 | 9/16 | 7/8 | 31/64 |
| 5 | 5/16 | 7/64 | 5/8 | 15/16 | 35/64 |
| 6 | 5/16 | 7/64 | 3/4 | 1-1/8 | 41/64 |
| 8 | 11/32 | 1/8 | 7/8 | 1-5/16 | 3/4 |
| 10 | 3/8 | 1/8 | 1 | 1-1/2 | 55/64 |
| 1/4 | 7/16 | 7/32 | | | |

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Table 4-9. Decimal Equivalent of Tool Sizes
(Sheet 1 of 4)

| | | | DECIMALS OF AN INCH | | | | DECIMALS OF AN INCH | | | | DECIMALS OF AN INCH | |
|------|------|-----------|---------------------|------|----|-----------|---------------------|-------|----|-----------|---------------------|-------|
| INCH | MM | WIRE GAGE | | INCH | MM | WIRE GAGE | | INCH | MM | WIRE GAGE | | |
| 1/64 | | 80 | .0135 | 1/16 | | | .0625 | | | 30 | .1285 | |
| | | 79 | .0145 | | | 1.6 | .062992 | | | 3.3 | .129921 | |
| | .4 | | .015625 | | | 1.65 | .0635 | | | 3.4 | .133858 | |
| | | | .015748 | | | 1.7 | .06496 | | | 29 | .136 | |
| | | 78 | .016 | | | | .066929 | | | 3.5 | .137795 | |
| | | 77 | .018 | | | 1.75 | .067 | | | 28 | .1405 | |
| | .5 | | .019685 | | | | .068897 | | | | .140625 | |
| | | 76 | .02 | | | 1.8 | .070866 | | | 3.6 | .141732 | |
| | | 75 | .021 | | | 1.85 | .072834 | | | 27 | .144 | |
| | .55 | | .021653 | | | | .073 | | | 3.7 | .145669 | |
| 1/32 | | 74 | .0225 | 5/64 | | 1.9 | .074803 | | | 3.75 | .147637 | |
| | .6 | | .023622 | | | | .076 | | | 25 | .1495 | |
| | | 73 | .024 | | | 1.95 | .076771 | | | 3.8 | .149606 | |
| | | 72 | .025 | | | | | | | 24 | .152 | |
| | .65 | | .02559 | | | | .078125 | | | 3.9 | .153543 | |
| | | 71 | .026 | | | | .0785 | | | 23 | .154 | |
| | .7 | | .027559 | | | 2 | .07874 | 5/32 | | | .15625 | |
| | | 70 | .028 | | | 2.05 | .080708 | | | 22 | .157 | |
| | | 69 | .02925 | | | | .081 | | | 4 | .15748 | |
| | .75 | | .029527 | | | | .082 | | | 21 | .159 | |
| 3/64 | | 68 | .031 | | | 2.1 | .082677 | | | 20 | .161 | |
| | | | | | | 2.15 | .084645 | | | 4.1 | .161417 | |
| | .8 | | .03125 | | | | .086 | | | 4.2 | .165354 | |
| | | 67 | .031496 | | | 2.2 | .086614 | | | 19 | .166 | |
| | | 66 | .032 | | | 2.25 | .088582 | 11/64 | | 4.25 | .167322 | |
| | .85 | | .033 | | | | .089 | | | 4.3 | .169291 | |
| | | 65 | .033464 | | | 2.3 | .090551 | | | 18 | .1695 | |
| | .9 | | .035433 | | | 2.35 | .092519 | | | | .171875 | |
| | | 64 | .036 | | | | .0935 | | | 17 | .173 | |
| | | 63 | .037 | 3/32 | | | .09375 | | | 4.4 | .173228 | |
| 1.15 | .95 | | .037401 | | | 2.4 | .094488 | | | 4.5 | .177165 | |
| | | 62 | .038 | | | | .096 | | | 15 | .18 | |
| | | 61 | .039 | | | 2.45 | .096456 | | | 4.6 | .181102 | |
| | 1 | | .03937 | | | | .098 | | | 14 | .182 | |
| | | 60 | .04 | | | 2.5 | .098425 | | | 13 | .185 | |
| | | | .041 | | | | .0995 | | | 4.7 | .185039 | |
| | 1.05 | | .041338 | | | | .1015 | | | 4.75 | .187007 | |
| | | 58 | .042 | | | 2.6 | .102362 | | | | .1875 | |
| | | 57 | .043 | | | | .104 | | | 4.8 | .188976 | |
| | 1.1 | | .043307 | 7/64 | | 2.7 | .106299 | | | 12 | .189 | |
| 1.55 | 1.15 | | .045275 | | | | .1065 | | | 11 | .191 | |
| | | 56 | .0465 | | | 2.75 | .108267 | | | 4.9 | .192913 | |
| | | | | | | | .109375 | | | 10 | .1935 | |
| | 1.2 | | .046875 | | | | .111 | | | 9 | .196 | |
| | | 55 | .047244 | | | 2.8 | .110236 | | | 5 | .19685 | |
| | 1.25 | | .049212 | | | | .111 | | | 8 | .199 | |
| | 1.3 | | .051181 | | | | .113 | | | 5.1 | .200787 | |
| | | 55 | .052 | | | 2.9 | .114173 | | | 7 | .201 | |
| | 1.35 | | .053149 | | | | .116 | | | | .203125 | |
| | | 54 | .055 | | | 3 | .11811 | | | 6 | .204 | |
| 1.55 | 1.4 | | .055118 | 1/8 | | | .12 | | | 5.2 | .204724 | |
| | 1.45 | | .057086 | | | 3.1 | .122047 | | | | 5 | .2055 |
| | 1.5 | | .059055 | | | | .125 | | | 5.25 | .206692 | |
| | | 53 | .0595 | | | 3.2 | .125984 | | | 5.3 | .208661 | |
| | 1.55 | | .061023 | | | 3.25 | .127952 | | | 4 | .209 | |

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Table 4-9. Decimal Equivalent of Tool Sizes
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| | | | DECIMALS OF AN INCH | | | | DECIMALS OF AN INCH | | | DECIMALS OF AN INCH |
|-------|------|-----------|---------------------|-------|-----|-----------|---------------------|-------|---------|---------------------|
| INCH | MM | WIRE GAGE | | INCH | MM | WIRE GAGE | | INCH | MM | |
| | | | LETTER SIZES | | | | DECIMALS OF AN INCH | | | |
| 7/32 | 5.4 | .212598 | 21/64 | 5/16 | 8 | | .3125 | 13.5 | .531495 | |
| | 5.5 | .213 | | | | O | .31496 | 35/64 | .546875 | |
| | 5.6 | .216535 | | 8.1 | | | .316 | 14 | .55118 | |
| | 5.7 | .21875 | | 8.2 | | P | .318897 | 9/16 | .5625 | |
| | 5.75 | .220472 | | 8.25 | | | .322834 | 14.5 | .570865 | |
| | 5.8 | .221 | | 8.3 | | | .323 | 37/64 | .578125 | |
| | 5.8 | .224409 | | 8.4 | | Q | .324802 | 15 | .59055 | |
| 15/64 | 5.75 | .226377 | | 8.5 | | | .326771 | 19/32 | .59375 | |
| | 5.8 | .228 | | 8.6 | | R | .328125 | 39/64 | .609375 | |
| | 5.8 | .228346 | | 8.7 | | | .330708 | 15.5 | .610235 | |
| | 5.9 | .232283 | 23/64 | 11/32 | 8.8 | | .332 | 5/8 | .625 | |
| | A | .234 | | 8.9 | | | .334645 | 16 | .62992 | |
| | 6 | .234375 | | 9 | | | .338582 | 41/64 | .640625 | |
| | B | .23622 | | 9.1 | | T | .339 | 16.5 | .649605 | |
| 1/4 | 6.1 | .240157 | | 9.2 | | | .342519 | 21/32 | .65625 | |
| | C | .242 | | 9.25 | | | .34375 | 17 | .66929 | |
| | 6.2 | .244094 | | 9.3 | | | .344487 | 43/64 | .671875 | |
| | D | .246 | | 9.4 | | | .346456 | 11/16 | .6875 | |
| | 6.25 | .246062 | | 9.5 | | | .350393 | 45/64 | .688975 | |
| | 6.3 | .248031 | | 9.6 | | | .35433 | 23/32 | .703125 | |
| | E | .25 | | 9.7 | | | .358 | 18 | .70866 | |
| 17/64 | 6.4 | .251968 | 3/8 | 9.8 | | | .358267 | 23/32 | .71875 | |
| | 6.5 | .255905 | | 9.9 | | | .359375 | 47/64 | .728345 | |
| | F | .257 | | 9.9 | | | .362204 | 19 | .734375 | |
| | 6.6 | .259842 | | 9.9 | | V | .364172 | 3/4 | .74803 | |
| | G | .261 | | 9.9 | | | .366141 | 49/64 | .765625 | |
| | 6.7 | .263779 | | 9.9 | | | .368 | 19.5 | .767715 | |
| | H | .265625 | | 9.9 | | | .370078 | 25/32 | .78125 | |
| 9/32 | 6.75 | .265747 | 25/64 | 9.9 | | | .374015 | 20 | .7874 | |
| | I | .266 | | 9.9 | | | .375 | 51/64 | .796875 | |
| | 6.8 | .267716 | | 9.9 | | | .377 | 20.5 | .807085 | |
| | 6.9 | .271653 | | 9.9 | | | .37952 | 13/16 | .8125 | |
| | J | .272 | | 9.9 | | | .381889 | 21 | .82677 | |
| | K | .279527 | | 9.9 | | | .383857 | 53/64 | .828125 | |
| | L | .281 | | 9.9 | | Z | .385826 | 27/32 | .84375 | |
| 19/64 | 7.2 | .28125 | 13/32 | 9.9 | | | .386 | 21.5 | .846455 | |
| | 7.25 | .283464 | | 10.5 | | | .389763 | 55/64 | .859375 | |
| | 7.3 | .285432 | | 10.5 | | | .390625 | 22 | .86614 | |
| | M | .287401 | | 11 | | X | .3937 | 7/8 | .875 | |
| | N | .29 | | 11 | | Y | .397 | 22.5 | .885825 | |
| | 7.4 | .291338 | | 11.5 | | Z | .404 | 57/64 | .890625 | |
| | 7.5 | .295275 | | 11.5 | | | .40625 | 23 | .90551 | |
| 7.6 | 7.5 | .296875 | 31/64 | 12 | | | .413 | 29/32 | .90625 | |
| | 7.6 | .299212 | | 12 | | | .413385 | 59/64 | .921875 | |
| | 7.7 | .302 | | 12.5 | | | .421875 | 23.5 | .925195 | |
| | 7.75 | .303149 | | 1/2 | | | .43307 | 15/16 | .9375 | |
| | 7.75 | .305117 | | 13 | | | .4375 | 24 | .94488 | |
| | 7.8 | .307086 | | 13 | | | .452755 | 61/64 | .953125 | |
| | 7.9 | .311023 | | 17/32 | | | .453125 | 24.5 | .964565 | |

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Table 4-9. Decimal Equivalent of Tool Sizes
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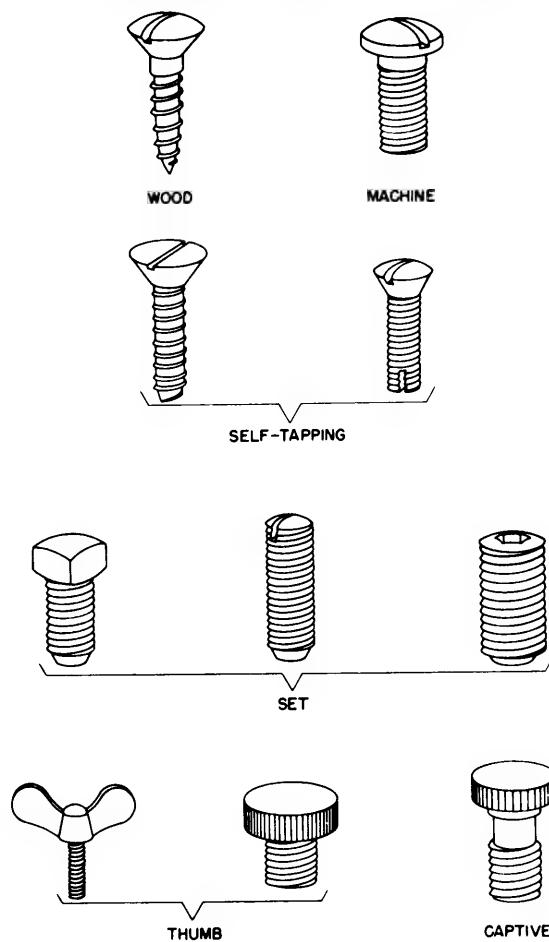
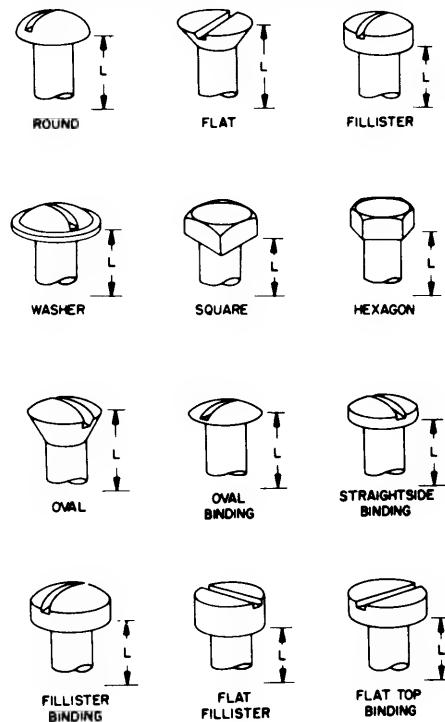
| INCH | MM | DECIMALS OF AN INCH | INCH | MM | DECIMALS OF AN INCH | INCH | MM | DECIMALS OF AN INCH |
|---------|------|---------------------|---------|------|---------------------|---------|------|---------------------|
| | 26.5 | 1.043305 | | 39.5 | 1.555115 | | 52.5 | 2.066925 |
| 1-3/64 | | 1.046875 | 1-9/16 | | 1.5625 | 2-5/64 | | 2.078125 |
| 1-1/16 | | 1.0625 | | 40 | 1.5748 | | 53 | 2.08661 |
| | 27 | 1.06299 | 1-37/64 | | 1.578125 | 2-3/32 | | 2.09375 |
| 1-5/64 | | 1.078125 | 1-19/32 | | 1.59375 | | 53.5 | 2.106295 |
| | 27.5 | 1.082675 | | 40.5 | 1.594485 | 2-7/64 | | 2.109375 |
| 1-3/32 | | 1.09375 | 1-39/64 | | 1.609375 | 2-1/8 | | 2.125 |
| | 28 | 1.10236 | | 41 | 1.61417 | | 54 | 2.12598 |
| 1-7/64 | | 1.109375 | 1-5/8 | | 1.625 | 2-9/64 | | 2.140625 |
| | 28.5 | 1.122045 | | 41.5 | 1.633855 | | 54.5 | 2.145665 |
| 1-1/8 | | 1.125 | 1-41/64 | | 1.640625 | 2-5/32 | | 2.15625 |
| 1-9/64 | | 1.140625 | | 42 | 1.65354 | | 55 | 2.16535 |
| | 29 | 1.14173 | 1-21/32 | | 1.65625 | 2-11/64 | | 2.171875 |
| 1-5/32 | | 1.15625 | 1-43/64 | | 1.671875 | | 55.5 | 2.185035 |
| | 29.5 | 1.161415 | | 42.5 | 1.673225 | 2-3/16 | | 2.1875 |
| 1-11/64 | | 1.171875 | 1-11/16 | | 1.6875 | 2-13/64 | | 2.203125 |
| | 30 | 1.1811 | | 43 | 1.69291 | | 56 | 2.20472 |
| 1-3/16 | | 1.1875 | 1-45/64 | | 1.703125 | 2-7/32 | | 2.21875 |
| | 30.5 | 1.200785 | | 43.5 | 1.712595 | | 56.5 | 2.224405 |
| 1-13/64 | | 1.203125 | 1-23/32 | | 1.71875 | 2-15/64 | | 2.234375 |
| 1-7/32 | | 1.21875 | | 44 | 1.73228 | | 57 | 2.24409 |
| | 31 | 1.22047 | 1-47/64 | | 1.734375 | 2-1/4 | | 2.25 |
| 1-15/64 | | 1.234375 | 1-3/4 | | 1.75 | | 57.5 | 2.263775 |
| | 31.5 | 1.240155 | | 44.5 | 1.751965 | 2-17/64 | | 2.265625 |
| 1-1/4 | | 1.25 | 1-49/64 | | 1.765625 | 2-9/32 | | 2.28125 |
| | 32 | 1.25984 | | 45 | 1.77165 | | 58 | 2.28346 |
| 1-17/64 | | 1.265625 | 1-25/32 | | 1.78125 | 2-19/64 | | 2.296875 |
| | 32.5 | 1.279525 | | 45.5 | 1.791335 | | 58.5 | 2.303145 |
| 1-9/32 | | 1.28125 | 1-51/64 | | 1.796875 | 2-5/16 | | 2.3125 |
| 1-19/64 | | 1.296875 | | 46 | 1.81102 | | 59 | 2.32283 |
| | 33 | 1.29921 | 1-13/16 | | 1.8125 | 2-21/64 | | 2.328125 |
| 1-5/16 | | 1.3125 | 1-53/64 | | 1.828125 | | 59.5 | 2.342515 |
| | 33.5 | 1.318895 | | 46.5 | 1.830705 | 2-11/32 | | 2.34375 |
| 1-21/64 | | 1.328125 | 1-27/32 | | 1.84375 | 2-23/64 | | 2.359375 |
| | 34 | 1.33858 | | 47 | 1.85039 | | 60 | 2.3622 |
| 1-11/32 | | 1.34375 | 1-55/64 | | 1.859375 | 2-3/8 | | 2.375 |
| | 34.5 | 1.358265 | | 47.5 | 1.870075 | | 60.5 | 2.381885 |
| 1-23/64 | | 1.359375 | 1-7/8 | | 1.875 | 2-25/64 | | 2.390625 |
| 1-3/8 | | 1.375 | | 48 | 1.88976 | | 61 | 2.40157 |
| | 35 | 1.37795 | 1-57/64 | | 1.890625 | 2-13/32 | | 2.40625 |
| 1-25/64 | | 1.390625 | 1-29/32 | | 1.90625 | | 61.5 | 2.421255 |
| | 35.5 | 1.397635 | | 48.5 | 1.909445 | 2-27/64 | | 2.421875 |
| 1-13/32 | | 1.40625 | 1-59/64 | | 1.921875 | 2-7/16 | | 2.4375 |
| | 36 | 1.41732 | | 49 | 1.92913 | | 62 | 2.44094 |
| 1-27/64 | | 1.421875 | 1-15/16 | | 1.9375 | 2-29/64 | | 2.453125 |
| | 36.5 | 1.437005 | | 49.5 | 1.948815 | | 62.5 | 2.460625 |
| 1-7/16 | | 1.4375 | 1-61/64 | | 1.953125 | 2-15/32 | | 2.46875 |
| 1-29/64 | | 1.453125 | | 50 | 1.9685 | | 63 | 2.48031 |
| | 37 | 1.45669 | 1-31/32 | | 1.96875 | 2-31/64 | | 2.484375 |
| 1-15/32 | | 1.46875 | 1-63/64 | | 1.984375 | | 63.5 | 2.499995 |
| | 37.5 | 1.476375 | | 50.5 | 1.988185 | 2-1/2 | | 2.5 |
| 1-31/64 | | 1.484375 | 2 | | 2. | 2-23/64 | | 2.515625 |
| | 38 | 1.49606 | | 51 | 2.00787 | | 64 | 2.51968 |
| 1-1/2 | | 1.5 | 2-1/64 | | 2.015625 | 2-17/32 | | 2.53125 |
| 1-33/64 | | 1.515625 | | 51.5 | 2.027555 | | 64.5 | 2.539365 |
| | 38.5 | 1.515745 | 2-1/32 | | 2.03125 | 2-35/64 | | 2.546875 |
| 1-17/32 | | 1.53125 | 2-3/64 | | 2.046875 | | 65 | 2.55905 |
| | 39 | 1.53543 | | 52 | 2.04724 | 2-9/16 | | 2.5625 |
| 1-35/64 | | 1.546875 | 2-1/16 | | 2.0625 | 2-37/64 | | 2.578125 |

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Table 4-9. Decimal Equivalent of Tool Sizes
(Sheet 4 of 4)

| INCH | MM | DECIMALS OF AN INCH | INCH | MM | DECIMALS OF AN INCH | INCH | MM | DECIMALS OF AN INCH |
|---------|------|---------------------|---------|----|---------------------|---------|------|----------------------|
| 2-19/32 | 65.5 | 2.578735 2.59375 | 67 | | 2.63779 2.640625 | 68 | | 2.67716 2.6875 |
| 2-35/64 | 66 | 2.59842 2.609375 | 2-41/64 | | 2.65625 2.657475 | 2-11/16 | 68.5 | 2.696845 2.703125 |
| 2-5/8 | 66.5 | 2.618105 2.625 | 2-21/32 | | 2.671875 | 2-45/64 | | 2.71653 |
| | | 2-43/64 | | | | | | |

AIAG618A

TYPICAL SCREW TYPES**HEAD TYPES FOR BOLTS AND SCREWS**

LENGTHS ARE SPECIFIED BETWEEN POINTS INDICATED BY ARROWS.

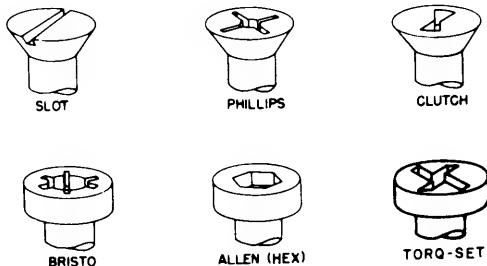
RECESSED DRIVES

Figure 4-1. Types of Screws

AIAGO 23

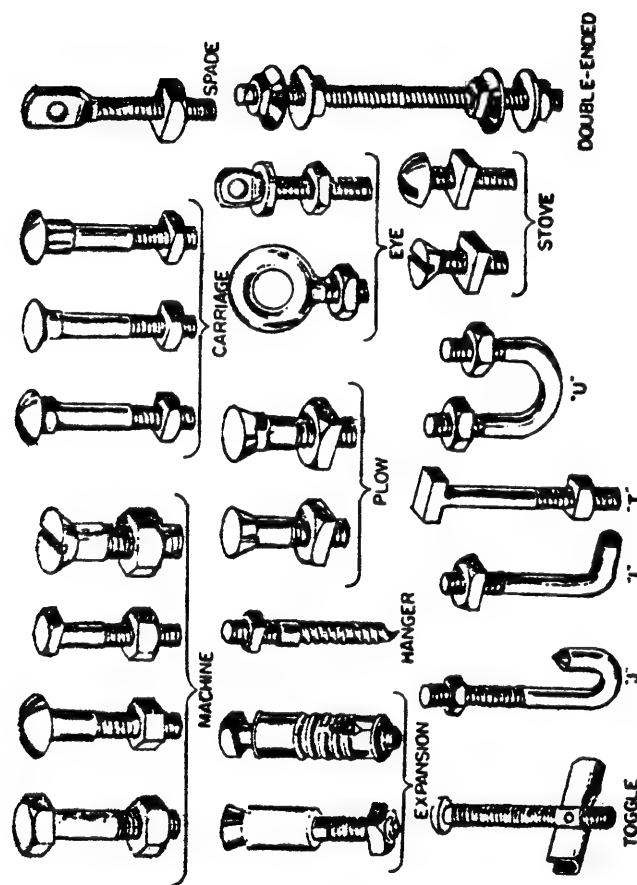


Figure 4-2. Types of Bolts

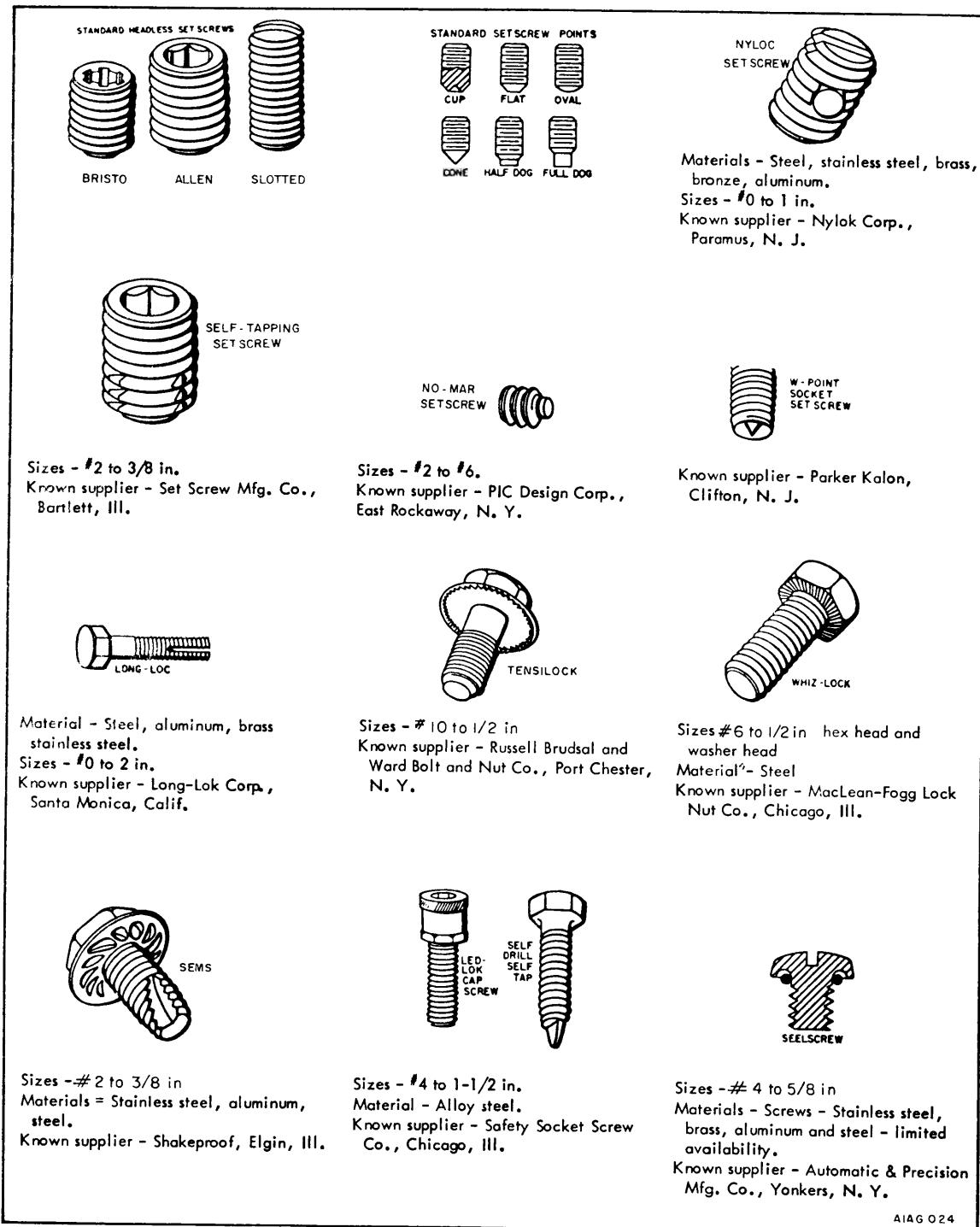
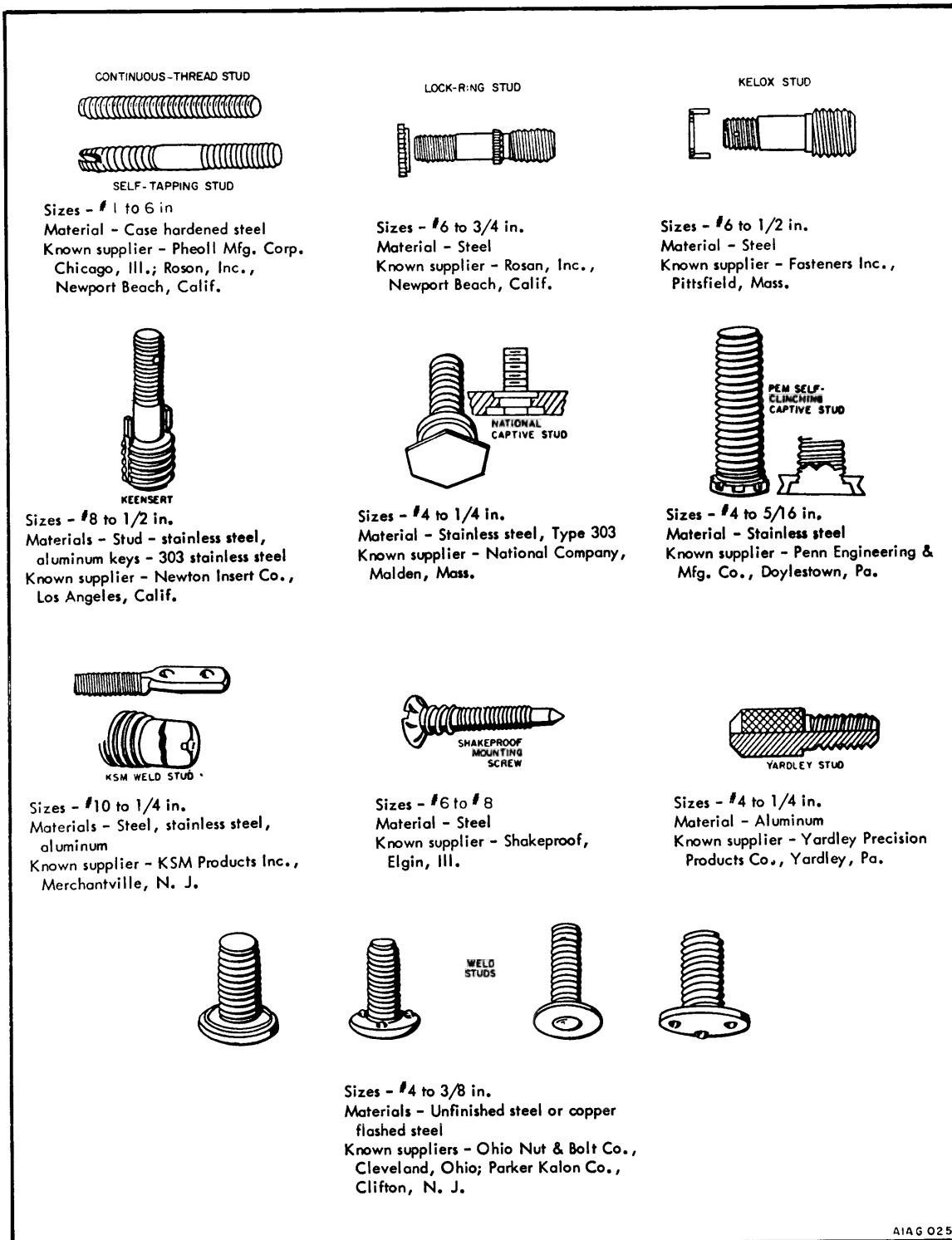


Figure 4-3. Set Screws



AIA G 025

Figure 4-4. Threaded Studs

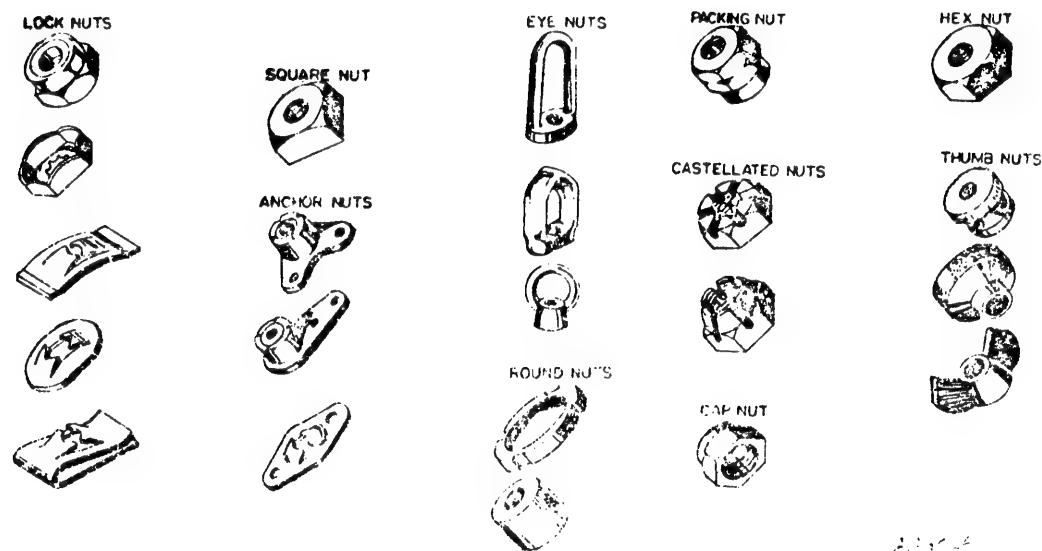


Figure 4-5. Nuts (Sheet 1 of 3)

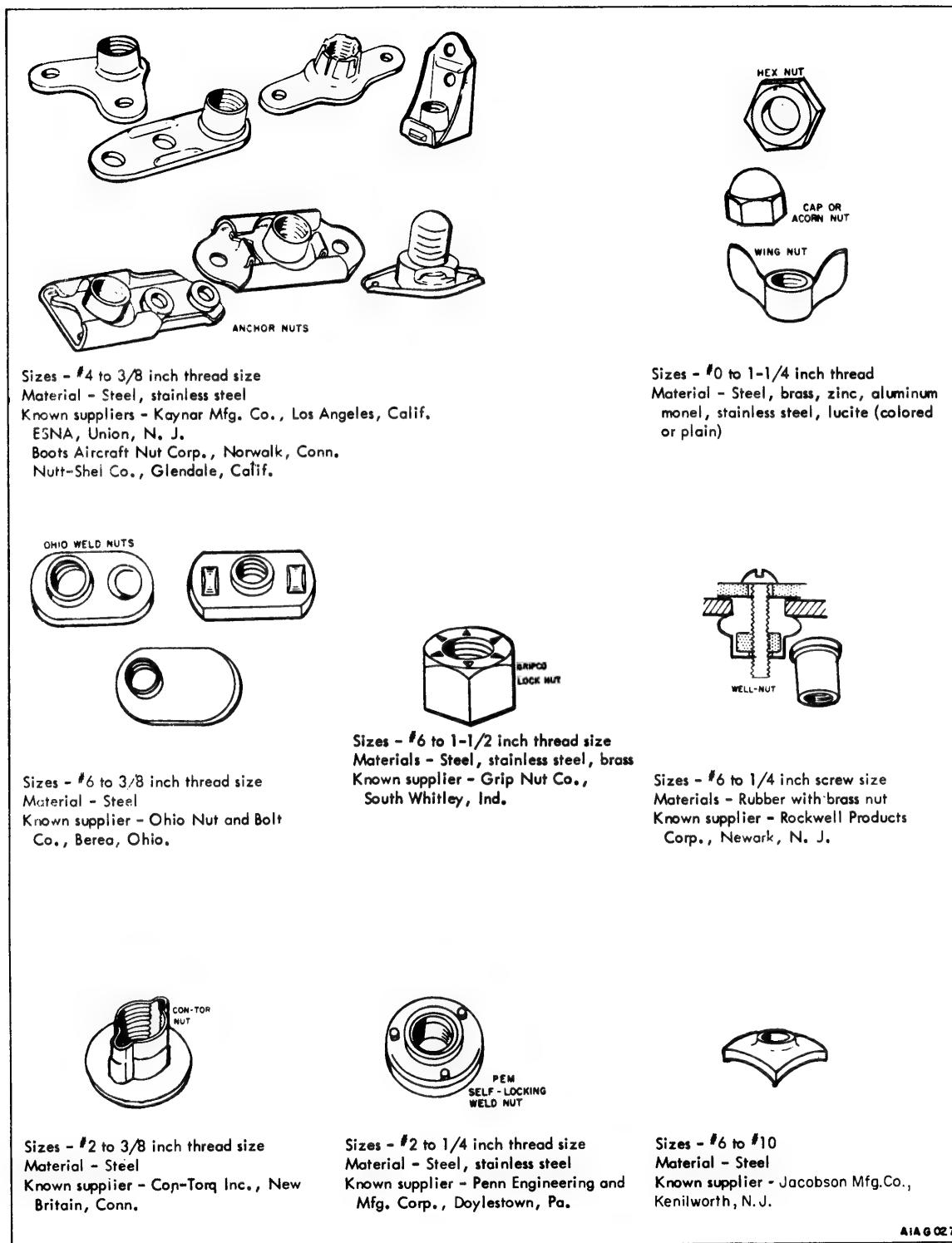


Figure 4-5. Nuts (Sheet 2 of 3)

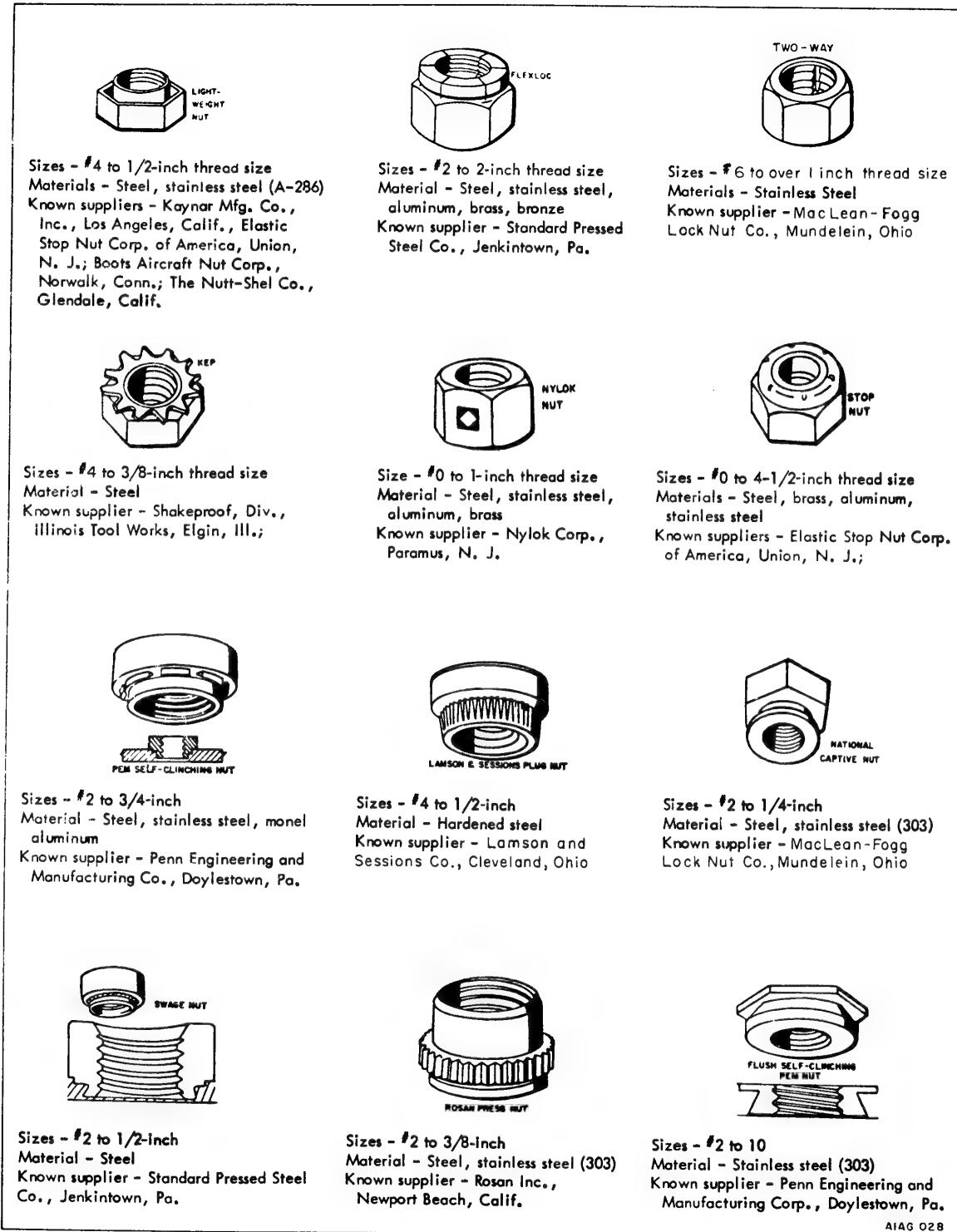
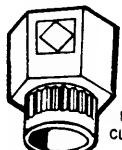
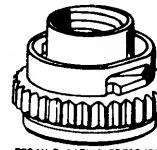


Figure 4-5. Nuts (Sheet 3 of 3)

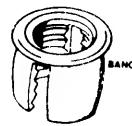
ESNA
CLINCH NUTNYLOC
CLINCH NUT

ROSAN FLOTTING PRESS NUT

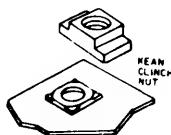
Sizes - #4 to 5/16 inch
Material - Steel, aluminum, brass
Known supplier - Elastic Stop Nut Corp.,
of America, Union, N. J.

Sizes - #4 to 5/16 inch
Material - Steel, Stainless steel,
aluminum, brass
Known supplier - Nylok Corp.,
Paramus, N. J.

Sizes - #4 to 1/2 inch
Material - Steel
Known supplier - Rosan Inc.,
Newport Beach, Calif.



BANC-LOC

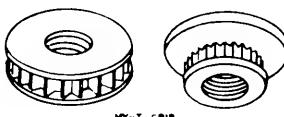
KEAN
CLINCH
NUT

PERMA-LOCK INSERT

Sizes - #4 to 1/4 inch
Material - Aluminum, brass, steel,
stainless steel
Known supplier - Boots Aircraft Nut
Corp., Norwalk, Conn.

Sizes - 1/4 to 1/2 inch
Material - Steel
Known supplier - MacLean-Fogg
Lock Nut Co., Mundelein, Ohio

Sizes - #4 to 9/16 inch
Material - Steel, brass, aluminum
Known supplier - J. B. Plevyak Mfg.
Co., Newton, N. J.

PEN
SELF-LOCKING SELF-CLINCHING
NUT

Sizes - #4 to 10
Material - Stainless steel (303), steel,
aluminum
Known supplier - Penn Engineering and
Manufacturing Corp., Doylestown, Pa.

FLUSH
ALL METAL
CLINCH NUT

Sizes - #2 to 1/4 inch
Material - Steel - heat-treated, stain-
less steel
Known suppliers - Kaynar Mfg. Co.
Inc., Los Angeles, Calif.; Elastic
Stop Nut Corp. of America, Union,
N. J.

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Figure 4-6. Clinch Nuts

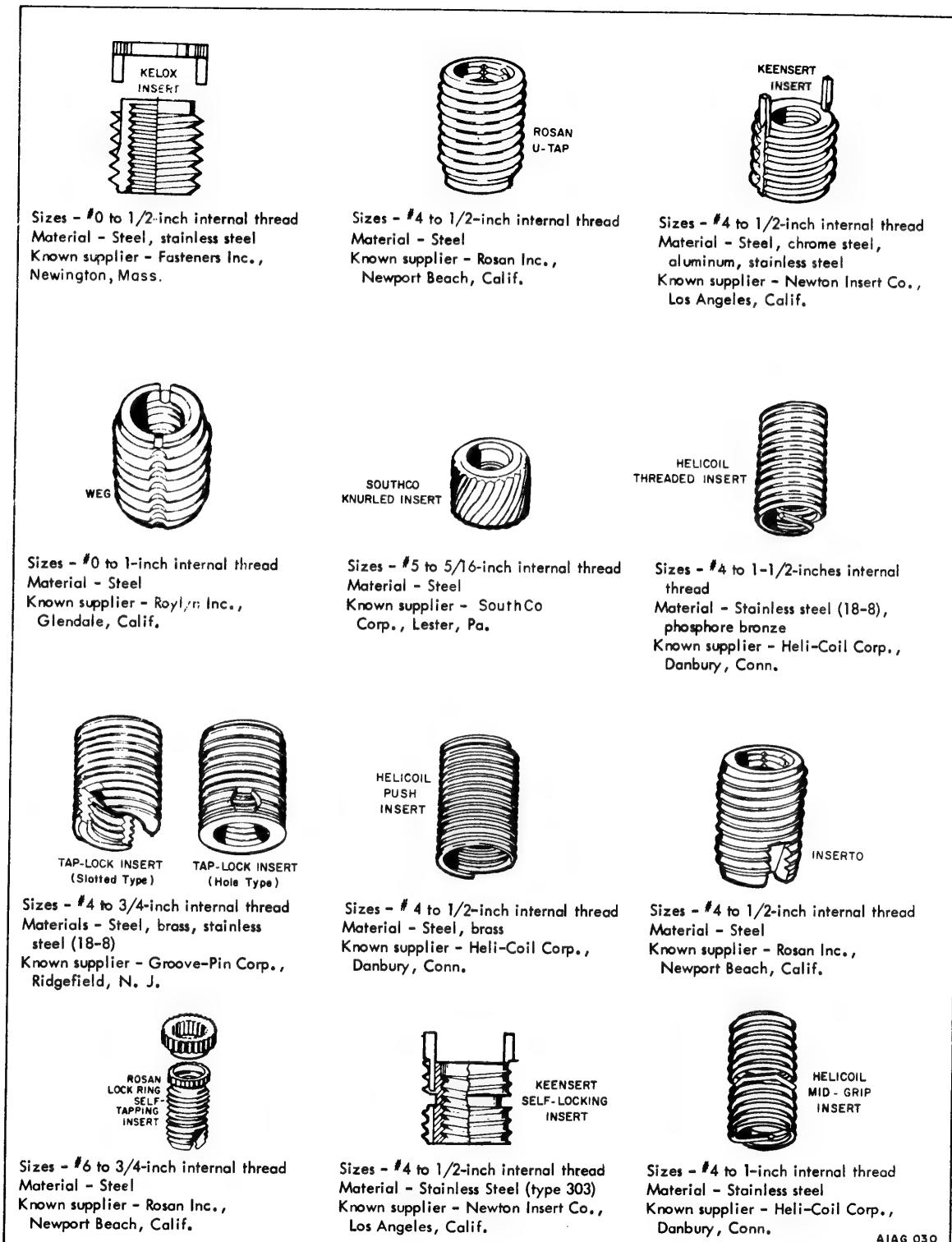
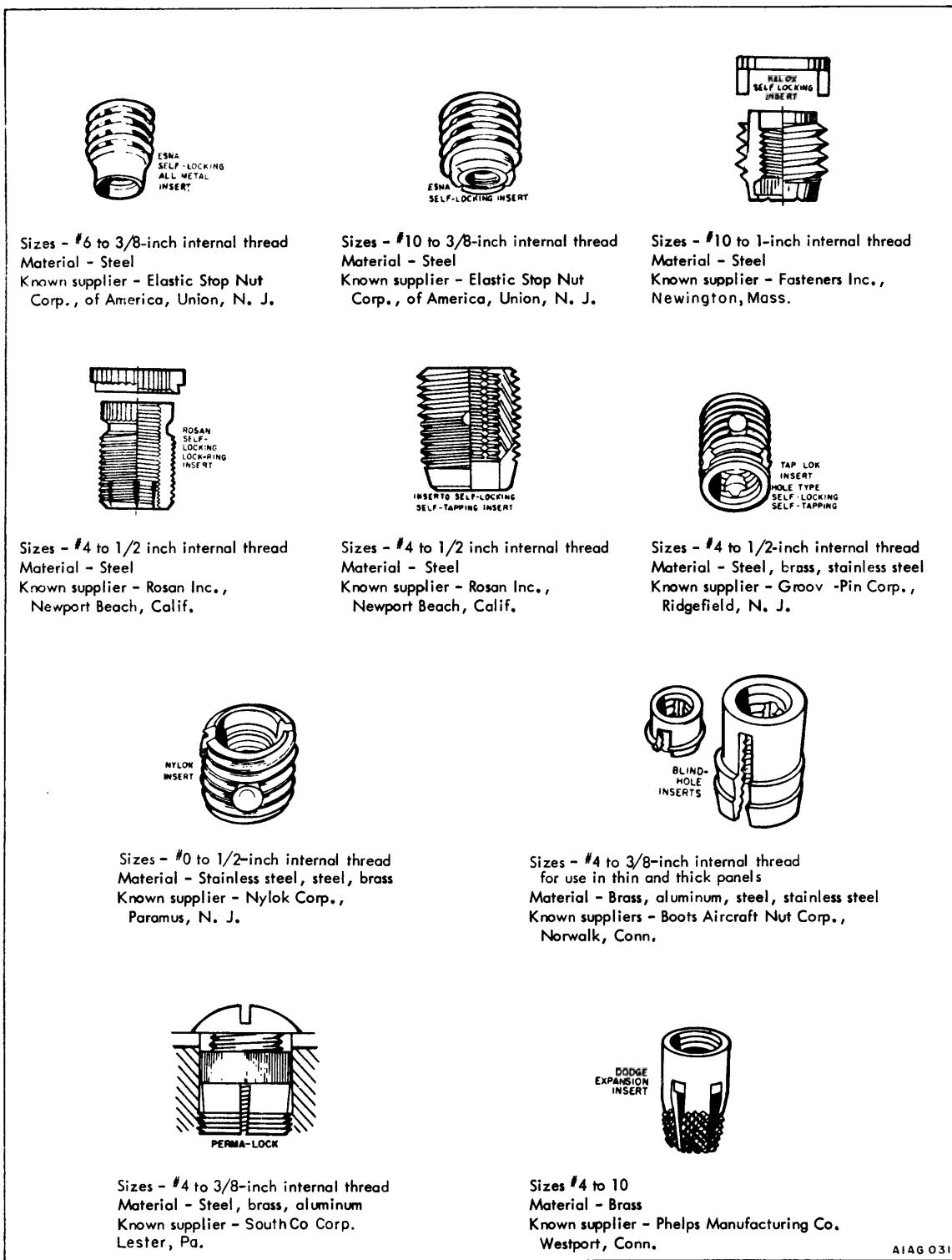


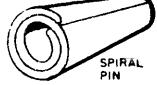
Figure 4-7. Inserts (Sheet 1 of 2)



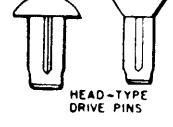
AIA G 031

Figure 4-7. Inserts (Sheet 2 of 2)

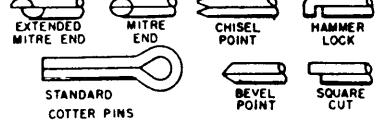
| HOLE SIZE AND SHEAR VALUES FOR SPIRAL PINS | | | | | |
|--|-----------------------|--------|---|-------------|------------|
| Pin Dia | Recommended Hole Size | | Double Shear in Lbs (Steel & Stainless 8A Steel Pins) | | |
| | Min | Max | Heavy Duty | Medium Duty | Light Duty |
| 0.031 | 0.031 | 0.0325 | ----- | 75 | ----- |
| 0.039 | 0.039 | 0.405 | ----- | 115 | ----- |
| 0.047 | 0.047 | 0.485 | ----- | 170 | ----- |
| 0.052 | 0.052 | 0.535 | ----- | 230 | ----- |
| 0.062 | 0.062 | 0.065 | 460 | 300 | 160 |
| 0.078 | 0.078 | 0.081 | 720 | 480 | 260 |
| 0.094 | 0.094 | 0.097 | 1030 | 690 | 370 |
| 0.109 | 0.109 | 0.112 | 1410 | 940 | 510 |
| 0.125 | 0.125 | 0.129 | 1840 | 1230 | 660 |
| 0.156 | 0.156 | 0.160 | 2880 | 1920 | 1040 |
| 0.187 | 0.187 | 0.192 | 4140 | 2760 | 1500 |
| 0.219 | 0.219 | 0.224 | 5640 | 3760 | 2040 |
| 0.250 | 0.250 | 0.256 | 7360 | 4900 | 2660 |
| 0.312 | 0.312 | 0.318 | 11500 | 7670 | 4160 |
| 0.375 | 0.375 | 0.382 | 16580 | 11040 | 8000 |
| 0.437 | 0.437 | 0.345 | 22540 | 15020 | 8160 |
| 0.500 | 0.500 | 0.510 | 29440 | 19600 | 10640 |


SPIRAL PIN

Sizes - 0.037-in. to 1/2-in. dia, 1/8-in. to 4-in. long, varying with dia
Material - Heat-treated 1070 steel (1/16 in. and over), stainless steel
Known supplier - C. E. M. Co., Danielson, Conn.


HEAD-TYPE DRIVE PINS

Size - 0.067-in. to 0.250-in. dia, 1/8 to 1/2-in. long, varying with dia
Material - Steel
Known supplier - Groov Pin Corp., Ridgefield, N. J.; Driv-Lok Pin Co., Sycamore, Ill.



Sizes - 0.031-in. dia to 0.750-in. dia
Material - Steel, brass, bronze, stainless steel, aluminum

| HOLE AND PIN SIZES FOR COTTER PINS | | | |
|------------------------------------|-----------------------|-----------------|--|
| Thread or Shaft Size (in.) | Cotter Pin Size (in.) | Hole Size (in.) | Distance of Hole Center from Shaft End |
| 1/8 | 1/32 | 3/64 | 3/64 |
| 3/16 | 3/64 | 1/16 | 5/64 |
| 1/4 | 1/16 | 5/64 | 7/64 |
| 5/16 | 5/64 | 3/32 | 7/64 |
| 3/8 | 3/32 | 7/64 | 9/64 |
| 7/16 | 3/32 | 7/64 | 11/64 |
| 1/2 | 1/8 | 7/64 | 11/64 |

AIAGO32

Figure 4-8. Pins (Sheet 1 of 2)

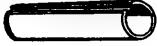
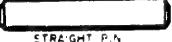
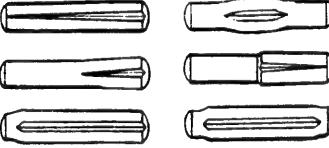
|  ROLL PIN <p>Sizes - 0.062-in. to 0.500-in. dia, 1/8- to 5-1/2-in. long varying with dia Material - Heat-treated carbon steel stain- less steel, beryllium copper Known suppliers - Standard Pressed Steel Jenkintown, Pa.; Elastic Stop-Nut Co., Union, N. J.</p> |  DOWEL PIN <p>Sizes - 1/8 to 7/8, 1/2 to 5- 1/2 in. long, varying with dia Material - Heat-treated alloy steel Rock- well C 60 to 62</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|-----------|--------|---|---|--------|--------|-------|-------|---------------|--------|-------|--------|--------|--------|--------|--------|---------------|--------|--------|--------|-------|--------|--------|--------|----------|-------|-------|-------|------|-------|-------|-------|---------------|--------|--------|--------|--------|--------|--------|--------|---------------|--------|--------|--------|--------|--------|--------|--------|-------|--|
| PIN INSTALLATION INFORMATION <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Pin Size</th> <th colspan="2">Hole Size</th> <th rowspan="2">Double Shear Strength Lbs (Steel Pins)</th> </tr> <tr> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>0.062</td> <td>0.062</td> <td>0.065</td> <td>425</td> </tr> <tr> <td>0.078</td> <td>0.078</td> <td>0.081</td> <td>650</td> </tr> <tr> <td>0.094</td> <td>0.094</td> <td>0.097</td> <td>1000</td> </tr> <tr> <td>0.125</td> <td>0.125</td> <td>0.129</td> <td>2100</td> </tr> <tr> <td>0.156</td> <td>0.156</td> <td>0.160</td> <td>3000</td> </tr> <tr> <td>0.187</td> <td>0.187</td> <td>0.192</td> <td>4400</td> </tr> <tr> <td>0.219</td> <td>0.219</td> <td>0.224</td> <td>5700</td> </tr> <tr> <td>0.250</td> <td>0.250</td> <td>0.256</td> <td>7700</td> </tr> <tr> <td>0.312</td> <td>0.312</td> <td>0.318</td> <td>11500</td> </tr> <tr> <td>0.375</td> <td>0.375</td> <td>0.382</td> <td>17600</td> </tr> <tr> <td>0.500</td> <td>0.500</td> <td>0.510</td> <td>25800</td> </tr> </tbody> </table> | Pin Size | Hole Size | | Double Shear Strength Lbs (Steel Pins) | Min | Max | 0.062 | 0.062 | 0.065 | 425 | 0.078 | 0.078 | 0.081 | 650 | 0.094 | 0.094 | 0.097 | 1000 | 0.125 | 0.125 | 0.129 | 2100 | 0.156 | 0.156 | 0.160 | 3000 | 0.187 | 0.187 | 0.192 | 4400 | 0.219 | 0.219 | 0.224 | 5700 | 0.250 | 0.250 | 0.256 | 7700 | 0.312 | 0.312 | 0.318 | 11500 | 0.375 | 0.375 | 0.382 | 17600 | 0.500 | 0.500 | 0.510 | 25800 |  STRAIGHT PIN <p>Size - 0.062 to 0.500 (12 standard diameters) Material - Steel, brass, bronze</p> |
| Pin Size | | Hole Size | | | Double Shear Strength Lbs (Steel Pins) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Min | Max | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.062 | 0.062 | 0.065 | 425 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.078 | 0.078 | 0.081 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.094 | 0.094 | 0.097 | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.125 | 0.125 | 0.129 | 2100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.156 | 0.156 | 0.160 | 3000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.187 | 0.187 | 0.192 | 4400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.219 | 0.219 | 0.224 | 5700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.250 | 0.250 | 0.256 | 7700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.312 | 0.312 | 0.318 | 11500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.375 | 0.375 | 0.382 | 17600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.500 | 0.500 | 0.510 | 25800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  GROOVED PINS <p>Sizes 3/64-in. diameter to 1/2-in. diameter, 1/4-in. long to 4-1/2-in. long, varying with dia Material - B1112 steel Known suppliers - Groov Pin Corp., Ridgefield, N. J.; Driv-Lok Pin Co., Sycamore, Ill.</p> | RECOMMENDED HOLE DIAMETERS FOR GROOVED PINS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Pin Size</th> <th>3/64</th> <th>1/16</th> <th>5/64</th> <th>3/32</th> <th>7/64</th> <th>1/8</th> <th>5/32</th> </tr> </thead> <tbody> <tr> <td>Hole Size Max</td> <td>0.0478</td> <td>0.640</td> <td>0.0798</td> <td>0.0956</td> <td>0.1113</td> <td>0.1271</td> <td>0.1587</td> </tr> <tr> <td>Hole Size Min</td> <td>0.0465</td> <td>0.0625</td> <td>0.0781</td> <td>0.938</td> <td>0.1094</td> <td>0.1250</td> <td>0.1563</td> </tr> <tr> <th>Pin Size</th> <th>3/16</th> <th>7/32</th> <th>1/4</th> <th>5/16</th> <th>3/8</th> <th>7/16</th> <th>1/2</th> </tr> <tr> <td>Hole Size Max</td> <td>0.1903</td> <td>0.2219</td> <td>0.2534</td> <td>0.3166</td> <td>0.3797</td> <td>0.4428</td> <td>0.5040</td> </tr> <tr> <td>Hole Size Min</td> <td>0.1875</td> <td>0.2188</td> <td>0.2500</td> <td>0.3125</td> <td>0.3750</td> <td>0.4375</td> <td>0.5000</td> </tr> </tbody> </table> | Pin Size | 3/64 | 1/16 | 5/64 | 3/32 | 7/64 | 1/8 | 5/32 | Hole Size Max | 0.0478 | 0.640 | 0.0798 | 0.0956 | 0.1113 | 0.1271 | 0.1587 | Hole Size Min | 0.0465 | 0.0625 | 0.0781 | 0.938 | 0.1094 | 0.1250 | 0.1563 | Pin Size | 3/16 | 7/32 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | Hole Size Max | 0.1903 | 0.2219 | 0.2534 | 0.3166 | 0.3797 | 0.4428 | 0.5040 | Hole Size Min | 0.1875 | 0.2188 | 0.2500 | 0.3125 | 0.3750 | 0.4375 | 0.5000 | | |
| Pin Size | 3/64 | 1/16 | 5/64 | 3/32 | 7/64 | 1/8 | 5/32 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hole Size Max | 0.0478 | 0.640 | 0.0798 | 0.0956 | 0.1113 | 0.1271 | 0.1587 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hole Size Min | 0.0465 | 0.0625 | 0.0781 | 0.938 | 0.1094 | 0.1250 | 0.1563 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pin Size | 3/16 | 7/32 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hole Size Max | 0.1903 | 0.2219 | 0.2534 | 0.3166 | 0.3797 | 0.4428 | 0.5040 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hole Size Min | 0.1875 | 0.2188 | 0.2500 | 0.3125 | 0.3750 | 0.4375 | 0.5000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Figure 4-8. Pins (Sheet 2 of 2)

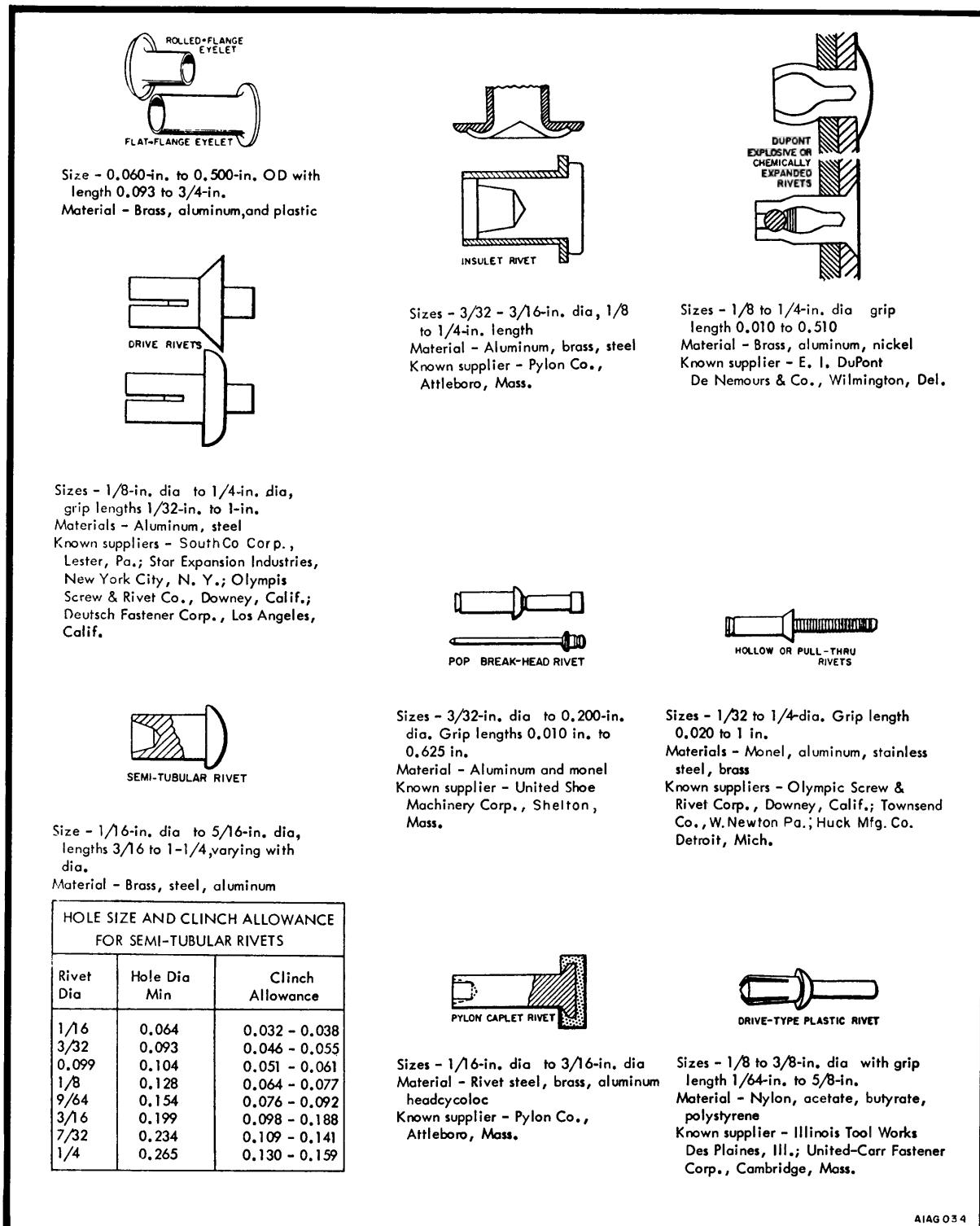
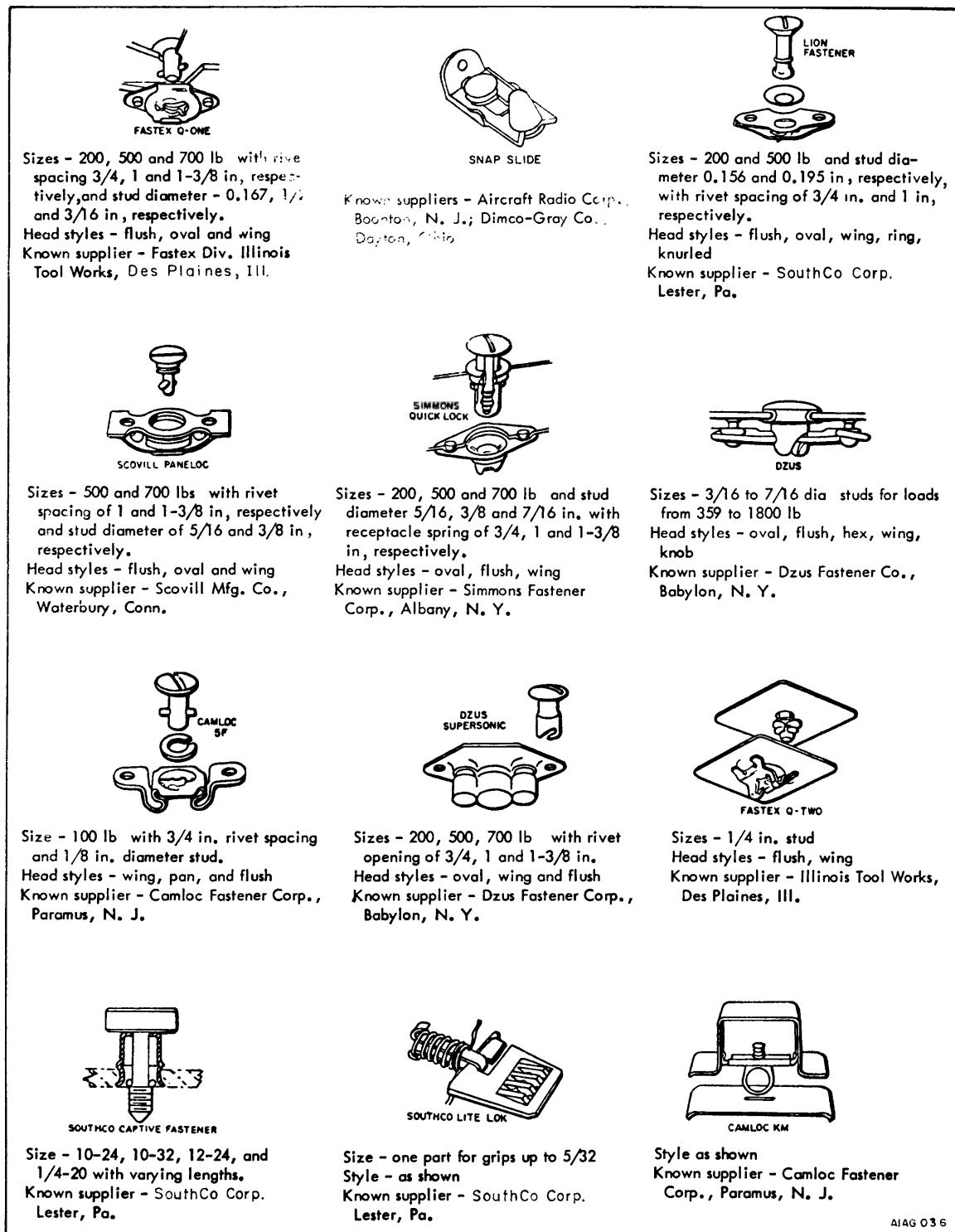


Figure 4-9. Rivets (Sheet 1 of 2)

| SOLID RIVETS | | Rivet Hole Sizes | | Solid Rivet Dimensions | |
|--------------|--|------------------|---------------|------------------------|----------|
| Rivet Size | | Hole Size Min | Hole Size Max | Max Head Height | Truss HD |
| 3/32 | | 0.093 | 0.096 | | |
| 1/8 | | 0.128 | 0.134 | | |
| 5/32 | | 0.160 | 0.167 | | |
| 3/16 | | 0.191 | 0.199 | | |
| 1/4 | | 0.255 | 0.264 | | |

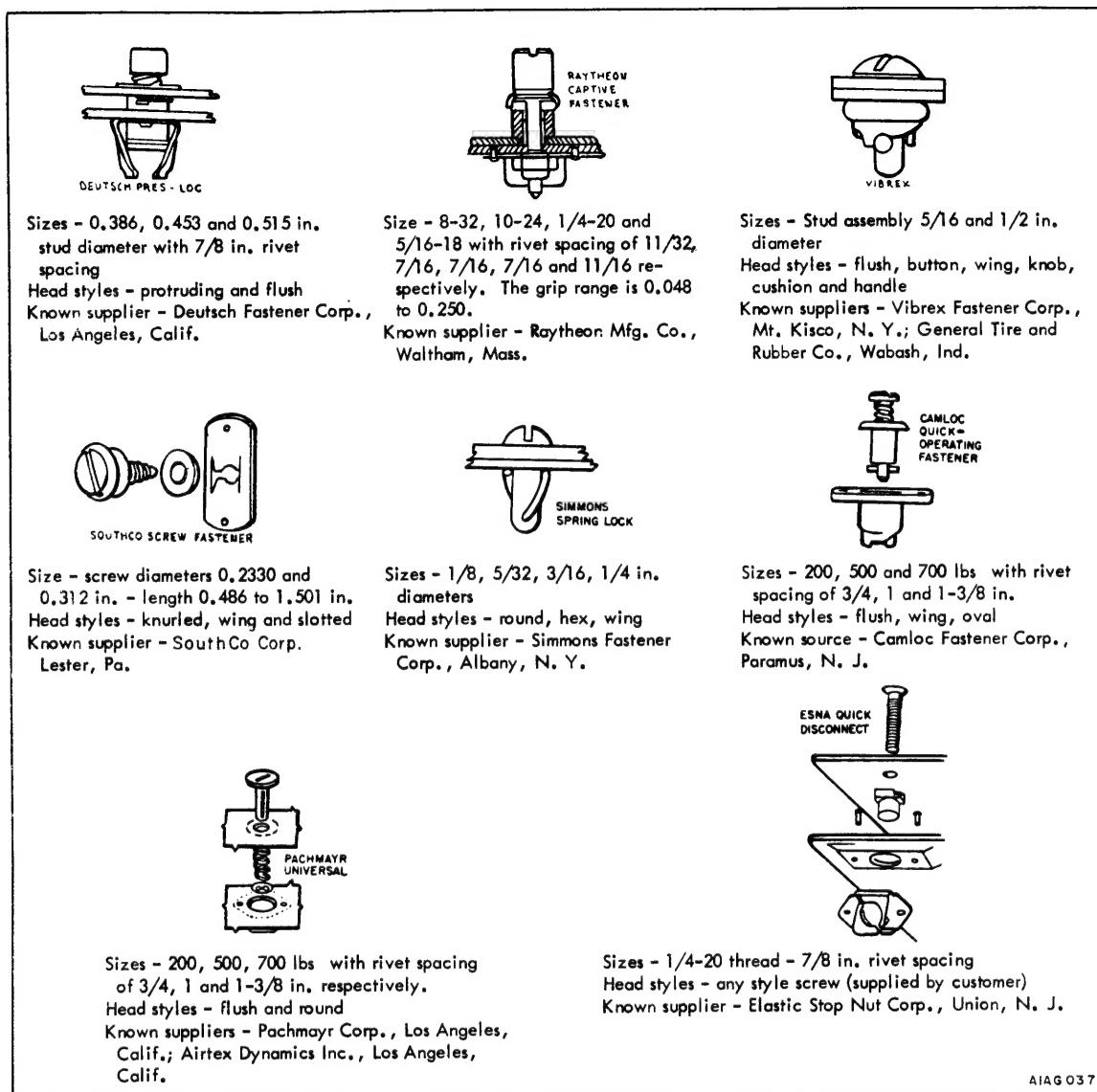
| Max Head Diameter | | Max Head Height | | | | | | | |
|-------------------|---------|-----------------|--------|----------|---------|--------|-----------|--------|----------|
| Body Dia | Flat HD | CSK HD | Pan HD | Truss HD | Flat HD | CSK HD | Button HD | Pan HD | Truss HD |
| 1/16 | 0.140 | 0.118 | 0.122 | 0.118 | ----- | 0.027 | 0.052 | 0.040 | ----- |
| 3/32 | 0.200 | 0.176 | 0.182 | 0.173 | 0.226 | 0.038 | 0.040 | 0.060 | 0.038 |
| 1/8 | 0.260 | 0.235 | 0.235 | 0.225 | 0.297 | 0.048 | 0.053 | 0.100 | 0.048 |
| 5/32 | 0.323 | 0.293 | 0.290 | 0.279 | 0.368 | 0.059 | 0.066 | 0.124 | 0.059 |
| 3/16 | 0.307 | 0.351 | 0.348 | 0.334 | 0.442 | 0.069 | 0.079 | 0.147 | 0.114 |
| 7/32 | 0.453 | 0.413 | 0.405 | 0.391 | 0.515 | 0.080 | 0.094 | 0.172 | 0.133 |
| 1/4 | 0.515 | 0.469 | 0.460 | 0.444 | 0.590 | 0.091 | 0.106 | 0.196 | 0.151 |

Figure 4-9. Rivets (Sheet 2 of 2)



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Figure 4-10. Fasteners (Sheet 1 of 2)



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Figure 4-10. Fasteners (Sheet 2 of 2)

| FLAT WASHER DIMENSIONS (ASA-B-27-2) | | | | | | | | |
|--|-----------------|-------|-------|-------|-------|-------|-------|-------|
| Size | #0 | #2 | #4 | #6 | #8 | #10 | 1/4 | |
| | 0.060 | 0.086 | 0.112 | 0.138 | 0.164 | 0.190 | 0.250 | |
| I. D. Min | 0.063 | 0.089 | 0.120 | 0.151 | 0.183 | 0.203 | 0.271 | |
| O. D. Max | Small Pattern | 0.130 | 0.193 | 0.255 | 0.318 | 0.380 | 0.411 | 0.505 |
| | Regular Pattern | 0.193 | 0.255 | 0.380 | 0.443 | 0.505 | 0.568 | 0.744 |
| Thickness Max | Small Pattern | 0.028 | 0.028 | 0.036 | 0.036 | 0.045 | 0.045 | 0.071 |
| | Regular Pattern | 0.028 | 0.028 | 0.045 | 0.045 | 0.045 | 0.045 | 0.071 |
| DIMENSIONS OF HELICAL SPRING LOCKWASHERS | | | | | | | | |
| Size | #2 | #4 | #6 | #8 | #10 | 1/4 | | |
| | 0.86 | 0.112 | 0.138 | 0.164 | 0.190 | 0.250 | | |
| I. D. Min | 0.88 | 0.115 | 0.141 | 0.168 | 0.194 | 0.255 | | |
| O. D. Max | Light Series | 0.165 | 0.202 | 0.239 | 0.280 | 0.323 | 0.489 | |
| | Medium Series | 0.175 | 0.212 | 0.253 | 0.296 | 0.337 | 0.493 | |
| Thickness Max | Light Series | 0.015 | 0.020 | 0.025 | 0.031 | 0.040 | 0.047 | |
| | Medium Series | 0.020 | 0.025 | 0.031 | 0.040 | 0.047 | 0.062 | |
| DIMENSIONS OF INTERNAL TOOTH LOCKWASHERS | | | | | | | | |
| Size | #2 | #4 | #6 | #8 | #10 | 1/4 | | |
| | 0.086 | 0.112 | 0.138 | 0.164 | 0.190 | 0.250 | | |
| I. D. Min | 0.089 | 0.115 | 0.141 | 0.168 | 0.195 | 0.256 | | |
| O. D. Max | 0.200 | 0.270 | 0.295 | 0.340 | 0.381 | 0.478 | | |
| Thickness Max | 0.015 | 0.019 | 0.021 | 0.023 | 0.025 | 0.028 | | |
| DIMENSIONS OF EXTERNAL TOOTH LOCKWASHERS | | | | | | | | |
| Size | #4 | #6 | #8 | #10 | 1/4 | | | |
| | 0.112 | 0.138 | 0.164 | 0.190 | 0.250 | | | |
| I. D. Min | 0.115 | 0.141 | 0.168 | 0.195 | 0.256 | | | |
| O. D. Max | 0.260 | 0.320 | 0.381 | 0.410 | 0.475 | | | |
| Thickness Max | 0.019 | 0.022 | 0.023 | 0.025 | 0.028 | | | |

Figure 4-11. Flat Washer Dimensions

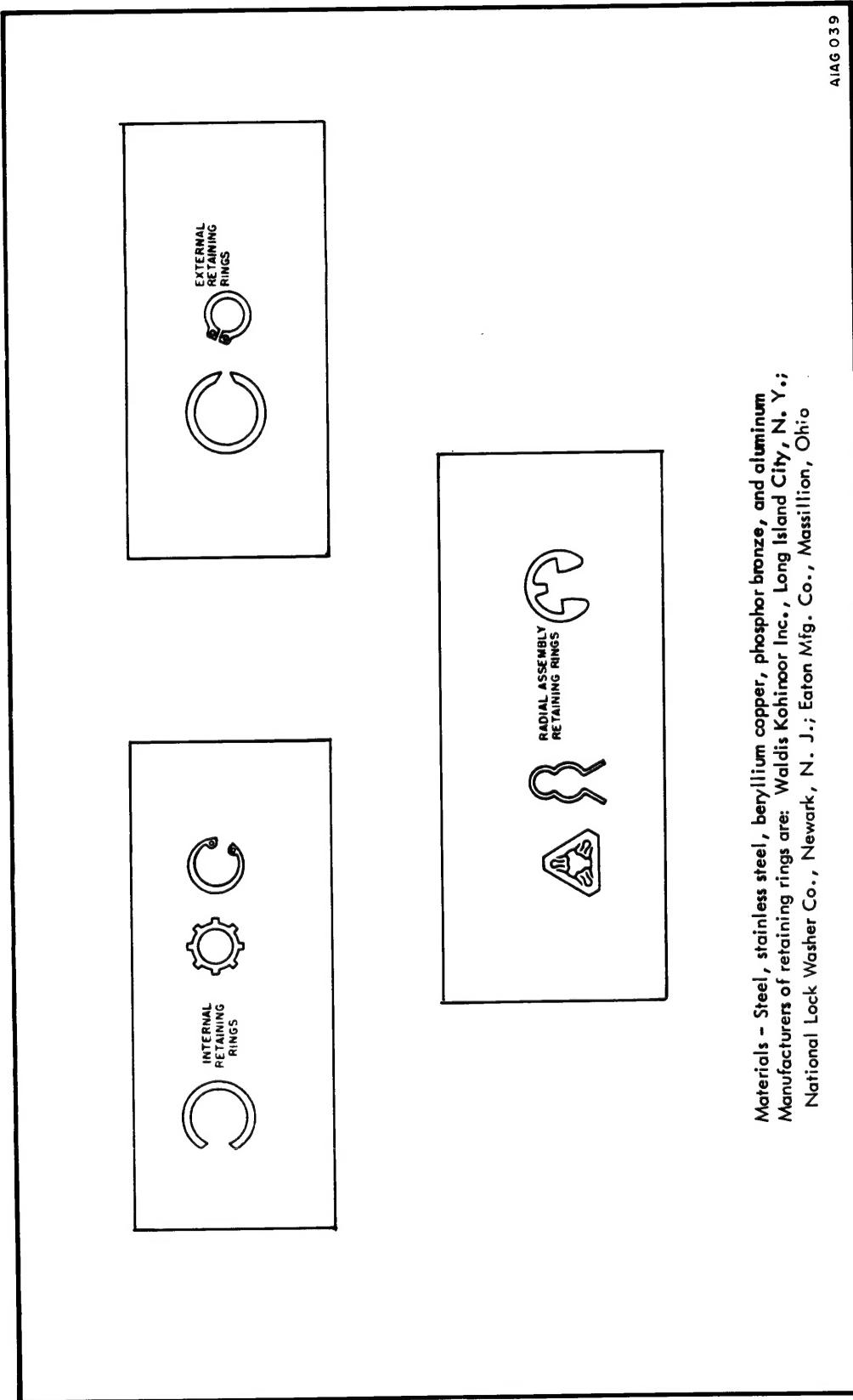


Figure 4-12. Retaining Rings

